Recovery Plan

Spotfin Chub (Hybopsis monacha)

Recovery Plan for

Spotfin Chub

Hybopsis monacha

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ACKNOWLEDGEMENTS SHOULD READ AS FOLLOWS:

U.S. Fish and Wildlife Service. 1983. Spotfin Chub Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 46p.

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PART I

INTRODUCTION

The spotfin chub (Hybopsis monacha) is listed as Threatened (Federal Register September 9, 1977) throughout its present range in the Tennessee River drainage in the States of North Carolina, Tennessee, and Virginia. Once occurring widely in 12 tributary systems lying in 5 states, it now is extant in only 4 systems: Little Tennessee River, North Carolina; Duck and Emory Rivers, Tennessee; and North Fork of Holston River, Tennessee and Virginia.

Reasons for the reduction or extirpation of the initial spotfin populations from most of their former range were likely due to intermittent detriments or permanent destruction of their habitats such as: impoundments, channelization, pollution, turbidity or siltation, temperature change, possibly overcollecting, and interspecific competition as described by Jenkins and Burkhead (1982).

This small cyprinid (maximum standard length 92 mm) was first described by Cope (1868) from specimens collected the year before from the North Fork Holston River near Saltville, Smyth County, Virginia. Although the fish has been collected since that time in other Tennessee River tributaries, the species was not seriously studied until after 1970.

The spotfin chub was listed as a threatened species under the Federal Endangered Species Act and the notice was published in the September 9, 1977, Federal Register, Volume 42, No. 175, pages 45527 to 45529. Concurrently with that listing, Critical Habitat was also designated to include the following:

> North Carolina--Macon and Swain Counties: Little Tennessee River, main channel from backwaters of Fontana Lake upstream to the North Carolina-Georgia State line.
>
> Tennessee--Cumberland, Fentress, and Morgan Counties: Emory and Obed Rivers and Clear and Daddys Creeks in Morgan County; Clear Creek in Fentress County; Obed River upstream to U.S. Interstate Highway 127 in Cumberland County. Hawkins and Sullivan Counties; North Fork Holston River, main channel upstream from junction with South Fork Holston River to the Tennessee-Virginia State line.
>
> Virginia--Scott and Washington Counties: North Fork Holston River, main channel from the Virginia-Tennessee State line upstream through Scott and Washington Counties.

(The Buffalo River of the Duck system was not included as Critical Habitat because, at the time of Critical Habitat designation, the species was thought to have been extirpated there.)

Historical and Present Distribution

Once endemic to the Tennessee River drainage in Alabama, Georgia, North Carolina, Tennessee, and Virginia, the spotfin's range included upland-mountain habitats in 4 physiographic provinces encompassing 12 tributary systems (Figure 1): Blue Ridge (French Broad River and Little Tennessee River systems), Ridge and Valley (Clinch River, Powell River, North and South Forks of Holston River, and Chickamauga Creek systems), Cumberland Plateau (Emory River and Whites Creek systems), and Interior Low Plateau (Shoal Creek, Little Bear Creek, and Duck River systems).

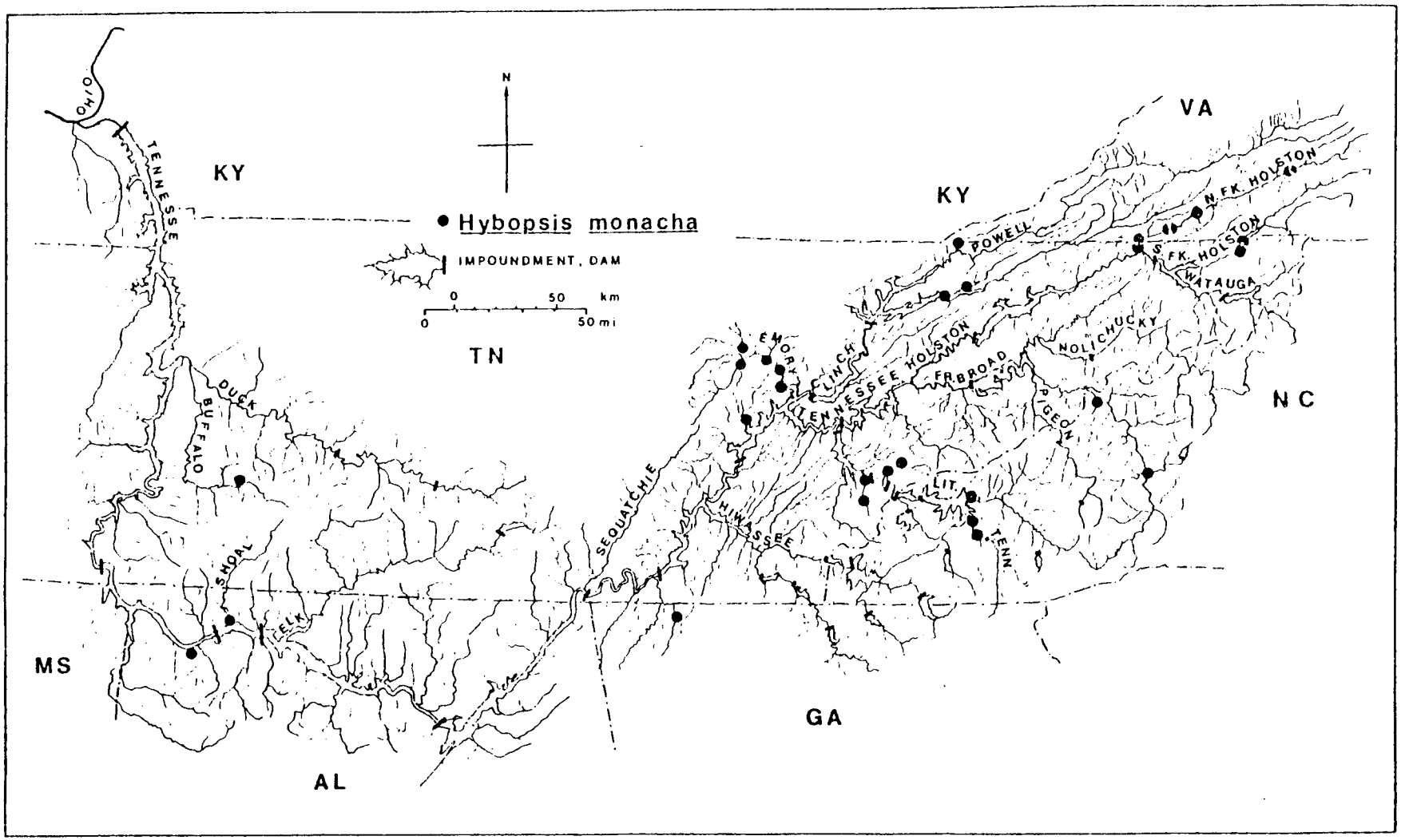

Figure 1
Distribution of Hybopsis monacha, showing all known extant and extirpated populations. Some dots cover more than one record locality. Records from three of four extant populations are shown in detail in Figs. 2-4. (Taken from Jenkins and Burkhead 1982).

Presently, it survives in some 166 total km of 4 isolated tributary systems: the Duck, Little Tennessee, Emory, and North Fork of Holston River systems.

Duck River System, Tennessee Even though the fish population of this large tributary system to the lower Tennessee River has been intensively sampled in recent years (1970-81), only four H. monacha specimens were located. These were collected in 1978 by N. H. Douglas (Douglas, personal communication as reported by Jenkins and Burkhead, 1982) in Buffalo River at the mouth of Grinders Creek, a small tributary to the Buffalo. During this period, Douglas collected some 50,000 fish by sampling annually at this single site. Several other collections have been made at this site, and elsewhere in the Buffalo. However, the only other H. monacha collection in this system was three specimens taken in middle Grinders Creek in 1937 by the Tennessee Valley Authority (TVA).

The Buffalo River still has moderately high species richness and its tributaries are typically clean, clear and contain varied substrate (Jenkins and Burkhead 1982). Isom and Yokley (1960) and Starnes et al. (1977) opined that the river is essentially pristine. Thus the apparent scarcity of H. monacha is a puzzle. Jenkins and Burkhead speculate that the species may be temperature limited by numerous high volume, cool springs in the Buffalo system.

Little Bear Creek System In 1937 during a preimpoundment survey of the lower section of this small northwestern Alabama stream, a single H. monacha was taken. The extreme lower section of Little Bear Creek in this area of the Tennessee River's southern bend region was inundated in 1938 by Pickwick

Reservoir. However, the capture site apparently was above the currently impounded portion; the creek probably has not been collected since 1937.

Shoal Creek System H. monacha was regarded as rare in 1884, when Gilbert (1891) recorded three specimens from lower Shoal Creek. The system has been sampled widely for the past 20 years (Wagers, 1974) without further records of H. monacha, and Ramsey (1976) regarded all Alabama populations as extirpated. At most, this species may have had only a marginal population in the western part of the Tennessee River bend area, which has been identified as a transitional area between lower and upper Tennessee faunas (Armstrong and Williams, 1971).

Chickamauga Creek System The first and only record of H. monacha in this system was taken in 1877 (Jordan and Brayton 1878) from South Chickamauga Creek at Ringgold, Georgia, where it was reported as abundant. The system was sparsely sampled before 1979, and has had a history of pollution, floods, and channelization. Apparently, the stream habitat has improved in the last few years, which is reflected by present ichthyofauna abundance and diversity including some rare or endangered species (Etnier, et al. 1981).

Citico Creek One specimen taken near the Creek's mouth and one from the middle section in 1940 are the only records of H. monacha from this creek. Regarding this population, Jenkins and Burkhead 1982 state "Only lower Citico may have provided preferred habitat, but because of longevity of good conditions and apparent current absence of H. monacha therein, we suspect the population was at least partly reliant on a hypothetical one in lower Little Tennessee River. Although the Little Tennessee River was freely

flowing at the Citico Creek mouth until 1979, it was a cold tailwater since at least 1944."

Abrams Creek The species was reported in lower sections (up to approximately 12 km above the mouth) of the creek in 1937 and 1941 and was taken in the 1957 rotenone treatment of the creek. This reclamation (intended to benefit introduced trout) along with the impoundment of the lower creek, likely caused this extirpation of the species from these waters.

Upper Little Tennessee River (Figure 2) J. S. Gutsell surveyed the Tuckasegee River and tributaries as early as 1930. Hildebrand (1932) reported on Gutsell's collections which included six sites on the main river. C. L. Hubbs and/or TVA personnel sampled three sites (1937-40) and J. R. Bailey made three more collections in 1947. Only two specimens of H. monacha were recovered from this preimpoundment sampling of the Tuckasegee System. These were taken from Noland Creek mouth in 1940 by Hubbs. Most of this area was inundated by Fontana Dam in 1945. Three sites were rotenoned above Fontana by a North Carolina Wildlife Resources Commission (NCWRC) crew in 1961 (Messer and Ratledge, 1963) and 10 sites were cresoled by TVA personnel in 1968 (Anon., 1971) without any record of H. monacha. Above the impounded area this river has a history of pollution.

Concurrent with the above referenced sampling of the Tuckasegee River, the upper Little Tennessee was sampled without H. monacha being found. Subsequently, the species was collected by TVA personnel during 1975-76 by kick-seining at four sites on the mainstream below the town of Franklin,

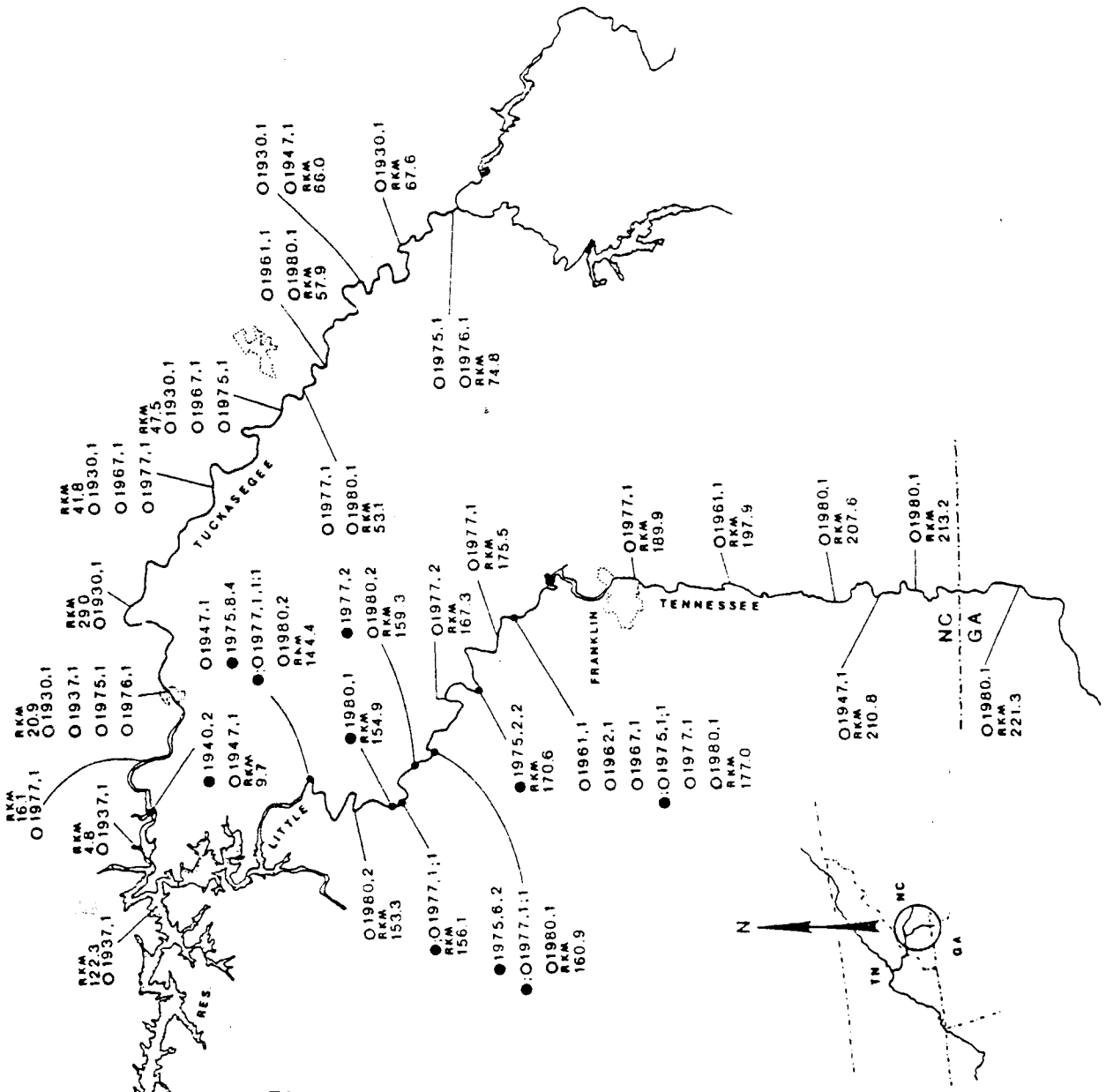

Fig. 2. Geochronography of Hybopsis monacha in Little Tennessee and Tuckasegee Rivers, North Carolina. Map shows all collections known from their main channels from Fontana Dam up to headwaters (except for one collection each from three unspecified lower and middle Tuckasegee sites in 1975). Collections from reservoir area were made prior to impoundment. Solid dots on rivers indicate capture sites, but not necessarily extant subpopulations. Offriver data are: year of collection(s), preceded by (1) solid dot if H. monacha taken, (2) open circle if not taken; following the year are: (3) number of specimens taken, if any (if specimens were taken more than once in a year, the number of specimens in each collection is given separately, hence indicating the number of collections yielding specimens), and lastly (4) the number of collections not yielding specimens (this number is separated by a semicolon from number of specimens). (Taken from Jenkins and Burkhead 1982).

North Carolina. During this same period similar sampling on the Tuckasegee and Cullasaja did not produce H. monacha. After the fish was located in the Little Tennessee area below Franklin in 1975, widespread and intensive sampling followed for the purpose of a status review. The range, defined by these surveys, spans approximately 32.3 km of the upper Little Tennessee from Fontana Reservoir to Franklin with H. monacha found at seven sites. Collectors or cooperators here (from 1975-80) included R. B. Eager (TVA) and D. A. Etnier, University of Tennessee; N. Burkhead, Roanoke College; and E. Crittenden, R. Smith, and H. D. Boles (USFWS).

French Broad River System Although there were two early records (Jordan, 1889) of H. monacha (three specimens) in the lower reaches of this system (Spring Creek, Swannanoa River) in North Carolina, the increase of general siltation, domestic and industrial pollution, along with population growth of smaller towns on the tributaries and of Brevard and Asheville on the mainstream, probably caused the extirpation of this population long before surveys were made by the state (Richardson et al. 1963).

Whites Creek System W. R. Taylor recorded seven spotfins caught under difficult seining conditions at 3 km above the Whites Creek arm embayment of Watts Bar Reservoir in 1959. A preimpoundment survey (rotenone) by TVA in 1941 at three sites failed to reveal H. monacha. Collections made by two TVA divers snorkeling above and below the record site in 1975, followed by three collections made in lower Whites Creek during 1981 by Crittenden (Crittenden, personal communication as reported by Jenkins and Burkhead 1982) did not reveal H. monacha.

Emory River System (Figure 3) The range of H. monacha in this system has been reduced in the lower reach by the Watts Bar impoundment (1942) and in the upper reaches mainly by silt or other detriments from coal mining (Anon., 1970; Riddle, 1975). This Cumberland Plateau system has been extensively surveyed since 1941. Seven preimpoundment collections from five sites were taken by TVA in 1941. In 1968 TVA used ichthyocides at 16 sites and Riddle in 1973-74 sampled by various methods.

The known H. monacha range, verified by sampling and/or on the basis of museum collections, extends from the mouth of White Creek on the Clear Creek tributary, and Lower Daddys Creek on the Obed tributary to the Emory River downstream to near the mouth of Crab Orchard Creek (Jenkins and Burkhead 1982). H. monacha specimens were identified as early as the collections made by TVA in 1941. Their abundance, noted in most of the combined sampling, was usually uncommon or rare in their recorded range.

Clinch River System A single specimen of H. monacha, taken in 1893 by Everman and Hildebrand and identified by Hubbs and Crowe (1956), was taken from the Clinch River in an area now inundated by Norris Reservoir. A small series was also taken in 1893 from lower Ball Creek near its confluence with Big Sycamore Creek, an area also later impounded by Norris Reservoir. Even though this species may have occupied the Clinch above the Norris Reservoir in early times, it was not found during extensive surveys after 1965 (Masnik 1974). Moreover, the history of continuous coal mining operations on the Virginia and Tennessee drainage into the upper Clinch and a major fish kill from an alkaline spill in 1967 (included 156 km of the stream above Norris Reservoir) on this river precluded the likelihood that H. monacha exists in

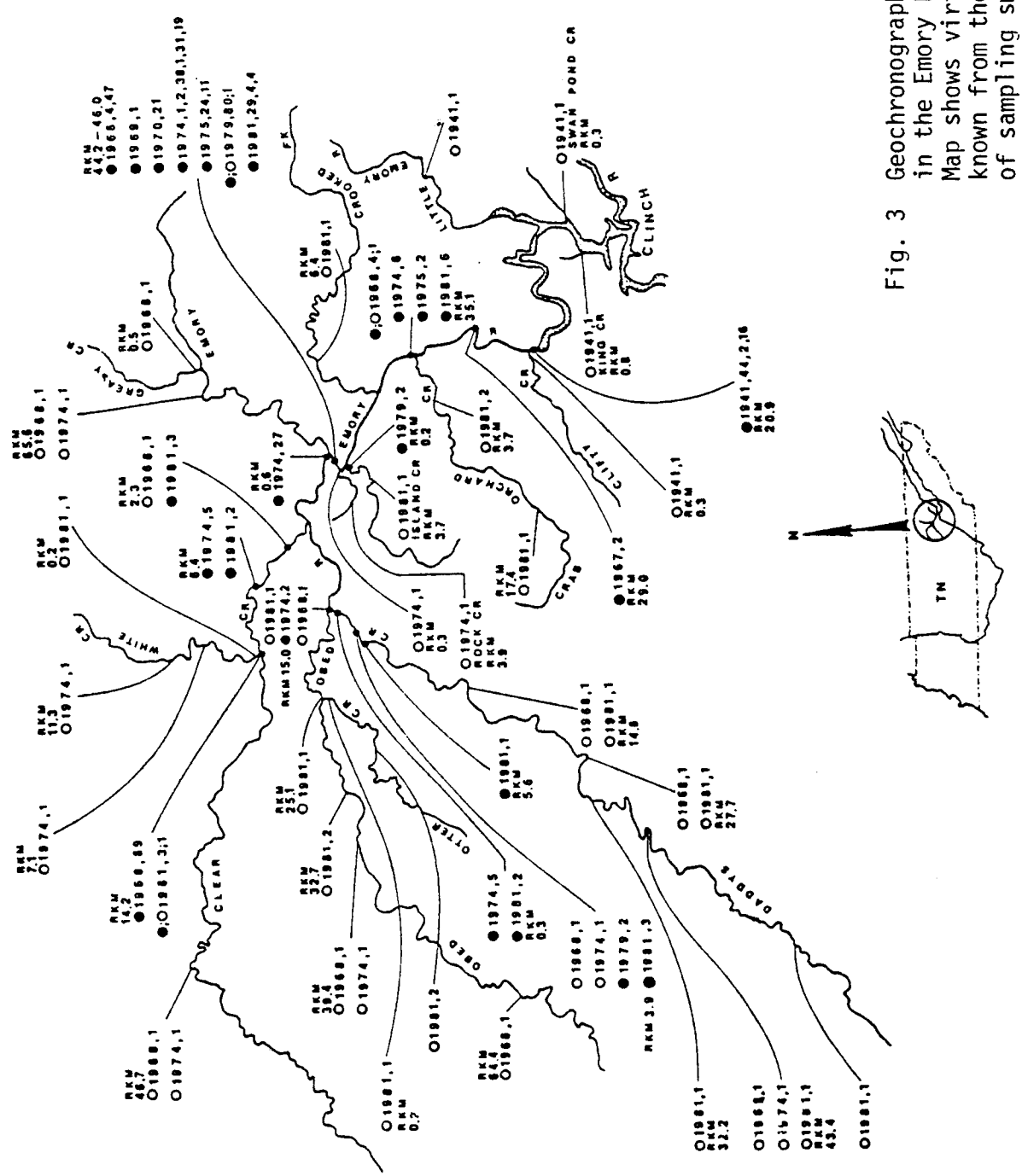

Fig. 3 Geochronography of Hybopsis monacha in the Emory River system, Tennessee. Map shows virtually all collections known from the system made by methods of sampling small fishes. Data format explained in Fig. 2. (Taken from Jenkins and Burkhead 1982.)

the upper drainage. The reduced water temperature in the fluvial drainage below Norris Reservoir, which is eventually impounded by Melton Hill Dam, forecloses any existence of this species further downstream.

Powell River System The spotfin distribution and collection history of the Powell system is similar to that of the upper Clinch. Everman and Hildebrand (1916) recorded three specimens from Indian Creek, Tennessee. This unimpounded tributary, its mouth, and the Powell itself were sampled extensively from 1964-81 with no further record of H. monacha (Taylor et al., 1971; Masnik, 1974; Starnes et al., 1977). As with the Clinch, there has been a history of coal mining pollution on the upper Powell River.

North Fork Holston River System (Figure 4) Sampling on the North Fork of the Holston River began as early as 1867 by Cope (1868), and through 1981 there had been 199 collections from 49 river sites. Of the above collections, from 1970-77, TVA had taken 67 collections from 22 stations by chemical treatment 1-4 times per year (Hill et al., 1975; Freeman, 1980). They also took four collections from one of the original stations (Click Island) in 1981 by a seine-snorkel method with some electrical field assistance. Burkhead and Jenkins (1982) also sampled during this latter period (1970-81) either by seine, shocker, or snorkeling.

Ranges of H. monacha were found in the following general river sections of the North Fork:

Lower North Fork Holston River Within the presently populated range of 72 km, from the mouth in Tennessee to western Washington County in Virginia, H.

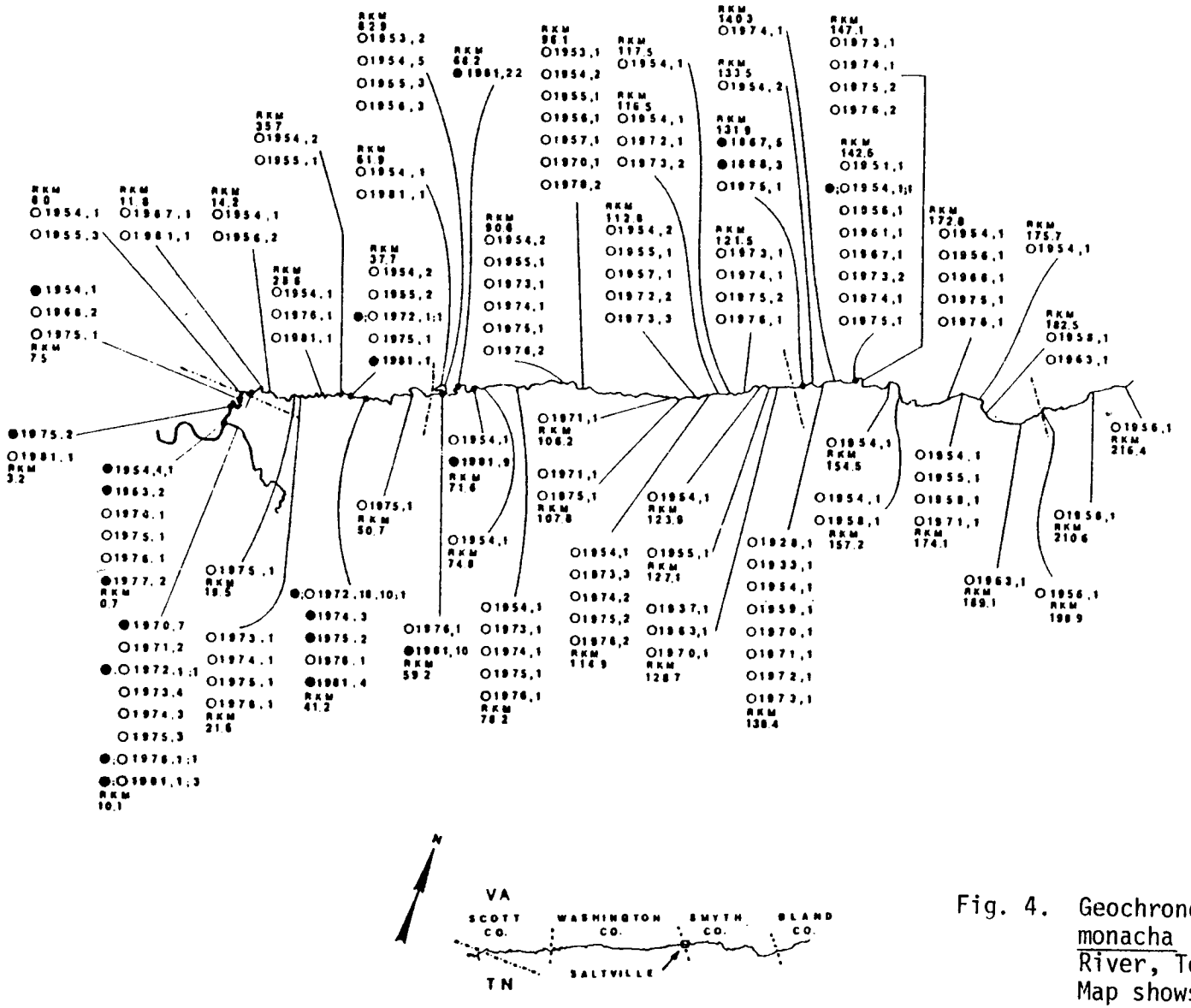

Fig. 4. Geochronography of Hybopsis monacha in North Fork Holston River, Tennessee and Virginia. Map shows virtually all known collections from the river. Data format explained in Fig. 2. (Taken from Jenkins and Burkhead 1982).

monacha was found at 6 of 14 sites, but was generally rare in numbers (Jenkins and Burkhead, 1982). Seven specimens were taken by Jenkins in 1970 by seining along Click Island (rkm 10.1), but further sampling at the same site in 1971, 1975, and 1981, yielded no more. Also, 13 rotenone collections by TVA (1971-76) in the same island area yielded only two H. monacha and five samples in 1981 yielded only one.

At the island off the mouth of Blue Springs Branch (rkm 41.2), 18 H. monacha were taken by seining May 16, 1972; 10 on June 4, 1972; but none on June 12, 1972 (Jenkins and Burkhead, 1982). Subsequent seining in 1974 and 1975 yielded 3 and 2, respectively, and chemical treatment of the island's left channel by TVA in 1976 yielded no H. monacha. Seining in 1981 yielded only two, which indicated a low reproduction rate or slow recruitment rate from other areas.

In a 13 km section of the river in western Washington County, Jenkins and Burkhead (1982) located H. monacha at three sites, with the greatest concentration at Hobbs Ford (rkm 68.2), an area of clean, small-medium gravel.

Some former H. monacha populations in the lower North Fork probably have either been extirpated by pollution moving downstream from Saltville or isolated in extant areas (possibly near tributary refugia), and are restricted from dispersion farther downstream by further pollution in the Kingsport area or by impoundment below Kingsport.

Upper North Fork Holston River Both Cope (1868) and Jordan (1889) reported H. monacha as "rare" or "scarce" in seining lengthy sections of the river in the Saltville area. Presumably this was before the onset of major pollution in that area. The fish was not found by Becker in 1928 or by TVA in 1933, but Patrick (1961) reported one specimen taken 7 km above Saltville in 1954. No others were reported in 44 collections made from 1954 through 1976.

South Fork Holston River In a preimpoundment survey by R. M. Bailey and TVA, 8 H. monacha specimens were collected from a 21 km section of the main channel of this river in Tennessee and 1 specimen was taken above the mouth of Jacob Creek, a tributary of this section. This population disappeared with the impoundment of South Holston Reservoir in 1950. No specimens were found during surveys made by Bailey and many others (1959-77) in the Virginia portion of this river. This population was apparently lost when South Holston Reservoir was completed (Jenkins and Burkhead, 1982). This area is also polluted (Anon., 1961; Higgins, 1978).

Description, Ecology, and Life History

Jenkins and Burkhead (1982) describe the spotfin chub as having a slightly compressed, elongated body ranging in standard length from about 20 mm early in the first year to about 85 mm in the third year of growth. Except for nuptial males, the color is a dusky green above the lateral line and silver on the lower sides bordered mid-dorsally and dorso-laterally by gold and green stripes. There are no blotches or speckling on the body, but the dorsal fin has a dark area posteriorly and a caudal fin spot is distinctive. The mouth is inferior with the upper lip expanded anteriad. Terminal small

labial barbels are present. Pharyngeal teeth are 4-4. Scales are moderately small with those of the lateral line ranging from 52-66. The anal fin has 8 rays. Sexual dimorphism includes longer dorsal, anal, and pelvic fins in the males; the dorsal fin insertion is also more anterior in males. Nuptial males develop antrorse tubercules over most of the top of the head and the front and side of the snout. Also they develop a prominent metallic blue color above the lateral line and the fins bear white margins.

The spotfin chub seems to be a phyletic key species linking two large, complex groups of eastern American minnows--shiners (Notropis) and certain non-nestbuilding barbeled "chubs" (Hybopsis).

The species is an insectivore, feeding diurnally presumably by both sight and taste in benthic areas of slow to swift current over various substrates with little siltation. The streams may range from 15-60 m in width and, where occupied, 0.3-1.0 m in depth. Water temperature in their summer habitat usually reaches greater than 20° C, and submerged macrophytes are usually absent, occasionally common. The species has been observed associated with sand, gravel, rubble, boulder,and bedrock substrates (Jenkins and Burkhead, 1982).

Jenkins and Burkhead (1982) estimated the chubs spawning period (mid-May to late August) from capture dates of turberculate males and females with ripe ova. No observation of clearly reproductive behavior is known.

Reasons for Decline and Threats to Continued Existence

Jenkins and Burkhead (1982) have numerically coded the various impacts which have exterminated, reduced, or are now affecting the extant populations of H. monacha. They further identified spotfin-inhabited length of each stream section within each system and coded the type of impact within direct and indirect impact categories (Table 1). Jenkins and Burkhead (1982) referred to the decline of the spotifn chub as follows:

"Hybopsis monacha survives in some 166 total km of four isolated tributary systems: one site in Buffalo River of the lower drainage; and in the upper drainage, one section each of Little Tennessee and North Fork Holston rivers, and essentially four streams of the Emory system (Table 6). Although current ranges identified within three systems (Little Tennessee excepted) may actually be somewhat greater, many subpopulations probably are discontinuous and no population is generally flourishing. Given the history of demise of H. monacha, and stresses affecting at least three of the remaining populations (Buffalo possibly excepted), their survival is remarkable and tenuity is suggested.

"Hybopsis monacha is a victim of numerous impacts, generally at least two on each population (Table 1). For the 24 at least once inhabited stream sections (and inferred hypothetical downstream extension through formerly suitable habitat for some), the following anthropogenic stresses are invoked to have exterminated populations, followed by number of streams directly affected: silt or coal fine sedimentation 12; pollution 10; inundation by reservoir 10; temperature depression of dam tailwater 3; and channelization

Table 1. Length (km) of stream sections with extant populations (some discontinuous), and anthropogenic and natural limiting factors on all known populations of Hybopsis monacha. "Indirect" impacts are on stream sections receiving populated tributaries (some of the former also were or remain populated). Impacts: 1 impoundment, 2 cold tailwater, 3 channelization, 4 siltation and/or coal fine sedimentation, 5 pollution (inorganic and/or organic), 6 population renovation, 7 localized collecting, 8 natural cool temperature, 9 small stream size. Impact may not refer to all parts of occupied section. (Taken from Jenkins and Burkhead 1982).

System	Stream	Length	Impact: Direct	Impact: Indirect
Duck	Buffalo	1	?8	-
	Grinders	-	?8, ?9	?8
Lit. Bear	Lit. Bear	-	?9	1
Shoal	Shoal	-	1	1
Chickamauga	S. Chickamauga	-	1,3,4,5	1
Lit. Tennessee	Citico	-	8,?9	1,2
	Abrams	-	1,6,8	1,2
	Tuckasegee	-	1,4,5,?8	1,4,5?8
	Lit. Tennessee	33	1,2,4,5,?8	-
French Broad	Spring	-	?5,?8,?9	4,5
	Swannanoa	-	4,5	4,5
Whites	Whites	-	1	1
Emory	Emory	25	1,4,5	1
	Island	0.2	?9	4,5
	Obed	15	4,5	4,5
	Clear	14	4,5	4,5
	Daddys	6	4,5	4,5
Clinch	Clinch	-	1,2,4,5	1
	Ball	-	?9	1
Powell	Indian	-	4	4
N. Fk. Holston	low. N. Fk. Holston	72	4,5,7	4,5
	up. N. Fk. Holston	-	4	4,5
S. Fk. Holston	S. Fk. Holston	-	1,2	4,5
	Jacob	-	1,?8,9	1

1. Most of these factors also affect master streams of tributaries, some of whose populations may have been at least partly dependent upon ingress of chubs from the former. Massive application of ichthyocide wiped out the entire Abrams Creek population. Localized seining in the North Fork Holston sharply depleted populations made vulnerable by enigmatic concentration at gravel areas. Natural factors such as cool maximum temperature and small stream size probably limited some populations. The latter two conditions tend to coincide, and when so, populations may have been truly marginal.

"The spotfin chub seems to be extinction prone. We could expect this of a large species when confined to a limited area, because of intrinsically low population density, and of predators at the top of food chains (Terborgh, 1974), but such clearly are unapplicable to H. monacha. Its competitive abilities, however, may be low. Except for one observation possibly more related to reproductive territoriality, its feeding activity seemed unaggressive and unopportunistic compared with several syntopic Notropis species, Hybopsis dissimilis, Nocomis micropogon and Phenacobius uranops. Spotfin chubs did not alter their benthic feeding to take drifting food stirred up from the substrate by observers; other fish did. Specimens cupped in a net and held in a bucket remained quiet on the bottom, contrasting with many shiners. However, such behaviors may be typical of many benthic insectivores such as H. monacha. Size and number of eggs are in the range of small cyprinids (Carlander, 1969), and the spawning period appears to be protracted. Fecundity may be much greater if it is a fractional spawner, and enhanced hatching success may attend crevice spawning, suggested in the Reproduction section. However, in North Fork Holston River self-recovery of the recruitment into depleted subpopulations were slight at best."

PART II

RECOVERY

A. Recovery Objectives:

The ultimate goal of this recovery plan is to restore viable populations* of spotfin chub (Hybopsis monacha) to a significant portion of its historic range and remove it from the Federal endangered species list. The spotfin chub shall be considered recovered when the following criteria are met, and no present or foreseeable threats exist which would cause it to become in danger of extinction throughout a significant portion of its range.

1. Through protection of existing populations and/or by introductions and/or discoveries of new populations there exist viable populations* in the Buffalo River System, Upper Little Tennessee River, Emory River System, and Lower North Fork Holston River of the following magnitudes.

    a. Buffalo River System, Tennessee: Species persists in the Buffalo River in the area of Grinders Creek and/or some other river section.

    b. Upper Little Tennessee River, North Carolina: The species occupies its preferred habitat throughout the approximately 32.5 km river reach from the head of Fontana Reservoir to near Franklin Dam. This can be measured by determining that

the species exists at a minimum of 10 locations along this river reach.

c. Emory River System, Tennessee: The species occupies its preferred habitat in the Emory River from its confluence with the Obed River to Watts Bar Reservoir, in Clear Creek from its confluence with White Creek downstream to its confluence with the Obed River, and Daddy's Creek from rkm 5.6 downstream to its confluence with the Obed River. This can be measured by determining that the species exists at a minimum of eight locations in the Emory River section, five locations in the Clear Creek sections, and five locations in the Daddy's Creek section.

d. North Fork Holston River, Tennessee and Virginia: The species occupies its preferred habitat throughout the river reach from its mouth upstream 72 km. This can be measured by determining that the species exists at a minimum of 15 locations along this river reach.

2. Through introductions and/or discovery of two new populations there exist viable* populations in two other rivers.

*Viable populations - Population monitoring over a ten-year period (biannual samples) indicates that the species is reproducing (at least two year classes present each year sampled) and that the population is either stable or expanding.

B. Recovery Outline

Prime Objective: Recover the spotfin chub to the extent that it no longer requires Federal Endangered Species Act protection.

1. Preserve populations and presently used habitat of the spotfin chub.

1.1 Continue to utilize existing legislation and regulations (Federal and state endangered species law, water quality requirements, stream alteration regulations, etc.) to protect the species and its habitat.

1.2 Conduct population and habitat surveys.

1.2.1 Determine species' present distribution and status.

1.2.2 Characterize the habitat and ecological association and determine essential elements (biotic and abiotic factors) of the species' habitat for all life history stages.

1.2.3 Determine the extent of the species' preferred habitat.

1.2.4 Present the above information in a manner which identifies specific areas in need of special attention.

1.3 Determine present and foreseeable threats to the spotfin chub and strive to minimize and/or eliminate the threats where necessary to meet the recovery objective.

1.3.1 Determine impacts on the species of the heavy sediment load carried by the upper Little Tennessee River.

1.3.2 Determine the impact of pollution from Saltville, Virginia, on the North Fork Holston River populations.

1.3.3 Investigate and inventory other factors negatively impacting the species and its environment.

1.3.4 Solicit information on proposed and planned projects that may impact the species.

1.3.5 Evaluate the potential threat to the species of overcollecting.

1.3.6 Determine measures that are needed to minimize and/or eliminate any adverse impacts and implement

when necessary to meet the criteria outlined in the recovery objectives.

1.4 Solicit help in protecting the species and its essential habitat.

1.4.1 Inform local government officials and regional and local planners of our plans to attempt recovery and request their support.

1.4.2 Request local, state, and Federal agencies to utilize their authorities to protect the species and its river habitat.

1.4.3 Meet with local industry interests and try to elicit their support in implementing protective actions.

1.4.4 Meet with landowners adjacent to the species' population centers and inform them of the project and try to get their support in habitat protection measures.

1.4.5 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, Boy-Scouts, church organizations, etc.

1.5 Investigate the use of Scenic River Status and/or other designations to protect the species.

2. Determine the feasibility of reestablishing the species back into its historic range and introduce where feasible and necessary to meet recovery objectives.

2.1 Survey rivers within the species' historic range to determine the availability and location of suitable transplant sites. This can include areas for population expansion within rivers where the species presently exists.

2.2 Investigate and determine the best method of establishing new populations, i.e., introduction of adults, juveniles, artificially raised individuals, or other means or combinations.

2.3 Where needed to meet the recovery objectives, reestablish the species within historic range.

2.4 Implement the same protective measures for these introduced populations as outlined for established populations in numbers 1.3 through 1.5 above.

3. Conduct life history studies not covered under section 1.2.2 above, i.e., age and growth, reproductive biology, longevity, natural mortality factors, and population dynamics.

4. Investigate the necessity for habitat improvement and, if feasible and necessary to meet recovery, develop techniques and sites for habitat improvement and implement.

5. Develop and implement a program to monitor population levels and habitat conditions of presently established populations as well as introduced and expanding populations.

6. Assess overall success of recovery program and recommend action (delist, continued protection, implement new measures, other studies, etc.).

C. Narrative Outline

1. Preserve populations and presently used habitat of the spotfin chub. Reestablishment of the species back into its former range may be feasible; however, the protection of established populations and their essential habitat is the key to the survival of the species.

1.1 Continue to utilize existing legislation and regulations (Federal and state endangered species law, water quality requirements, stream alteration regulations, etc.) to protect the species and its habitat. This species, although listed as threatened, could easily become an endangered species if presently known populations are not maintained.

1.2 Conduct population and habitat surveys.

1.2.1 Determine species' present distribution and status. Conduct population and habitat surveys where H. monacha is expected to have potential habitat or known extant "populations": Duck River system (Buffalo River); Little Tennessee River system (Upper Little Tennessee and Tuckasegee River); North Fork Holston River system (lower North Fork); Emory River system (Obed River, White Creek, Clear Creek, Daddy's Creek, Orchard Creek, Crooked Creek, and upper and lower Emory River areas). Also, survey lower Little Bear Creek, Colbert County, Alabama; this stream apparently has not been collected since H. monacha was found there in 1937.

Once distribution and status are known, the future emphasis of the recovery plan can be charted. If sufficient other populations are found, protection of habitat may be the prime management tool. However, if no other populations are encountered, introductions will be necessary.

1.2.2 Characterize the habitat and ecological association and determine essential elements (biotic and abiotic factors) of the species' habitat for all life history stages. To adequately protect

potential habitat it should be characterized completely. Different workers specify different habitat characters with various substrates and feeding habits and other behavior. More information should be known of silt limitation, requirements of larval stage, and winter habitat, and spawning habitats.

1.2.3 Determine the extent of the species' preferred habitat. As knowledge on the preferred habitat is gathered, this information should be utilized to delineate specific habitat areas that need special attention within each stream.

1.2.4 Present the above information in a manner which identifies specific areas in need of special attention. The use of maps delineating areas of special concern will allow planners to avoid sensitive areas.

1.3 Determine present and foreseeable threats to the spotfin chub and strive to minimize and/or eliminate the threats where necessary to meet the recovery objective. Each river system inhabited by the species may be subject to certain environmental influences which threaten the species and its habitat. To minimize and/or eliminate these threats where needed to meet recovery, the threats must be identified; they

must be correlated with species' specific habitat requirements gathered under 1.2.2; and measures must be taken to alleviate the problem areas.

1.3.1 Determine impacts on the species of the heavy sediment load carried by the upper Little Tennessee River. The mica fines and mobile fine sand emanating from farming and mining cause a major water and substrate quality problem in the upper Little Tennessee River. The extent of the impact on the species must be determined. The recovery of the species in the upper Little Tennessee River may not be possible without control of this problem.

1.3.2 Determine the impact of pollution from Saltville, Virginia, on North Fork Holston River populations. The State of Virginia is actively involved in an attempt to minimize this problem. If this problem is impacting recovery, FWS should actively support these efforts.

1.3.3 Investigate and inventory other factors negatively impacting the species and its environment. Threats to the species in each river must be assessed. Some threats such as gravel dredging and point source pollution may be fairly obvious to

determine. However, other subtle factors may be adversely impacting the species.

1.3.4 Solicit information on proposed and planned projects that may impact the species. If the species is to be delisted, the Service must be assured that there are no proposed and/or planned projects that could likely jeopardize the continued existence of the species. Once all negative factors are assessed, those that would seriously affect the species will need to be minimized in order to effect recovery for the species.

1.3.5 Evaluate the potential threat to the species of overcollecting. If overcollecting is a threat, methods to control it should be implemented. However, such restrictions should not unduly interfere with legitimate and beneficial research that will aid in recovery of the species.

1.3.6 Determine measures that are needed to minimize and/or eliminate any adverse impacts and implement when necessary to meet the criteria outlined in the recovery objectives.

1.4 Solicit help in protecting the species and its essential habitat. Section 7 consultation under the Endangered Species

Act and Fish and Wildlife Coordination activities can assist in protecting the species, but these activities alone cannot recover the species. The assistance of other Federal agencies as well as state and local governments will be essential. Also, support of the local industrial and business community, as well as local people, will be needed to meet the goal of recovering the species. Without a commitment from the people in these river valleys who have an influence on habitat quality, the recovery effort will be doomed.

1.4.1 Inform local government officials and regional and local planners of our plans to attempt recovery and request their support.

1.4.2 Request local, state, and Federal agencies to utilize their authorities to protect the species and its river habitat.

1.4.3 Meet with local industry interests and try to elicit their support in implementing protective actions. Gaining cooperation from industries responsible for adverse impacts is an essential and most direct way to gain protective action for meeting recovery goals.

1.4.4 Meet with landowners adjacent to the species' population centers and inform them of the project and try to get their support in habitat protection measures. Private land owners may be unaware of adverse effects from their land use adjacent to species population centers; therefore, diplomacy may have to be substituted for authority to gain positive support of the recovery program and responsible protection.

1.4.5 Develop an educational program using such items as slide/tape shows, brochures, etc. Present this material to business groups, civic groups, Boy Scouts, church organizations, etc. Educational material outlining the goals of the recovery action with emphasis on the other benefits of maintaining and upgrading habitat quality will be extremely useful in informing the public of our actions.

1.5 Investigate the use of Scenic River Status and/or other designations to protect the species. Scenic River Status or other designations that recognize a particular river resource may be useful in protecting the river and thus aiding in the perpetuating of the species.

2. Determine the feasibility of reestablishing the species back into its historic range and introduce where feasible and necessary to

meet recovery objectives. Introductions may be necessary in order to increase the number of populations of spotfin chubs and thus increase the security of the species. In some cases, introductions will involve other streams outside its present range. However, introductions may also be useful to accelerate the expansion of the species within a stream presently inhabited by the species.

2.1 Survey rivers within the species' historic range to determine the availability and location of suitable transplant sites. This can include areas for population expansion within rivers where the species presently exists. The first step in the reintroduction of the species will be to locate suitable habitat for transplants. The information collected under Section 1.1.2 will be essential in locating these sites.

2.2 Investigate and determine the best method of establishing new populations, i.e., introduction of adults, juveniles, artificially raised individuals, or other means or combinations. Sufficient stock may not be available in the streams presently inhabited by the species to allow for enough chubs to be taken from these rivers to meet the needs for successful introductions. It may be necessary to artificially rear the species in a hatchery situation and use these individuals for stocking new rivers.

2.3 Where needed to meet the recovery objectives, reestablish the species within historic range where it is likely it will become established. If habitat is available, introductions are likely to succeed, and introductions are needed to meet the recovery objectives, the reestablishment of the species into other rivers within its historic range should proceed.

2.4 Implement the same protective measures for these introduced populations as outlined for established populations in numbers 1.3 through 1.5 above.

3. Conduct life history studies not covered under section 1.1.2 above, i.e., age and growth, reproductive biology, longevity, natural mortality factors, and population dynamics. Much of the information needed to manage the species will be available after completion of the tasks outlined in 1.1.2. However studies involving the fish's life history will likely be required to fully understand the response of the species to protective measures.

4. Investigate the necessity for habitat improvement and, if feasible and necessary to meet recovery, develop techniques and sites for habitat improvement and implement. Specific components of the chubs' habitat may be missing and these may limit the potential expansion and reintroduction of the species. Habitat improvement programs and activities may be helpful in alleviating these limiting factors.

5. Develop and implement a program to monitor population levels and habitat conditions of presently established populations as well as introduced and expanding populations. Once recovery actions are implemented, the response of the chub and its habitat must be monitored to assess any progress towards recovery. This will likely require an biannual census schedule.

6. Annually assess overall success of recovery program and recommend action (Changes in recovery objectives delist, continued protection, implement new measures, other studies, etc.). The recovery plan must be evaluated periodically to determine if it is on track and to recommend future actions. As more is learned about the species, the recovery objectives may need to be modified.

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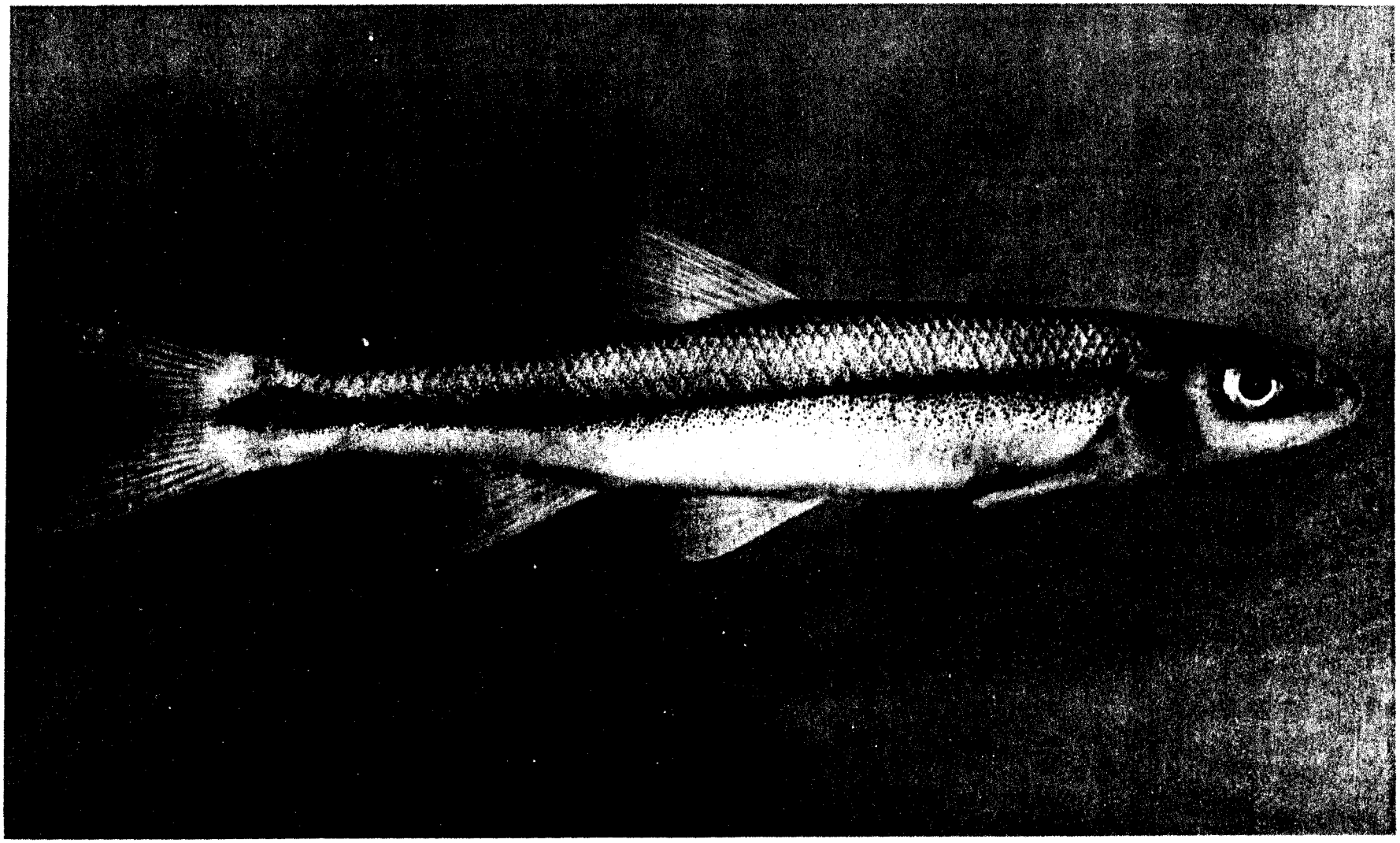

Spotfin Chub (Hybopsis monacha)

PART III.

IMPLEMENTATION SCHEDULE

Priorities within this section (Column 4) have been assigned according to the following:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of the species.

Spotfin Chub

Part III Implementation Schedule

General Category[1*]	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			3* Comments/Notes
					FWS Region	FWS Program	Other[2*]	FY 1	FY 2	FY 3	
01-04	Continue to utilize existing legislation and regulations to protect species and habitat	1.1	2	continuous	4&5	SE&ES	Tennessee Valley Authority (TVA) In. Wildlife Resources Agcy. (TWRA) Va. Comm. of Game & Inland Fisheries (VCGIF) Tennessee Heritage Program (THP) NC Natural Heritage Program (NCNHP), NC Wildlife Resources Commission (NCWRC)	1,000	1,000	1,000	*1. See attachment: general categories for Implementation Schedules *2. Other agencies' responsibility would be of a cooperative nature or projects funded under a contract or grant program. In some cases contracts could be let to universities or private enterprises.
I1,I2	Determine species present distribution and status	1.2.1	3	1 yr.	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	20,000	---	---	*3. Note: ALL ESTIMATES ARE FOR FWS FUNDS ONLY
R3,R8, R9,R10 R11	Characterize habitat and determine essential elements	1.2.2	3	2 yr	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	---	10,000	---	
R3,02, M3	Determine the extent of preferred habitat and present information in a manner which identifies areas in need of species attention	1.2.3 & 1.2.4	3	1 yr	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	---	---	5,000	
I12,I14	Determine present and foreseeable threats to species	1.3.1 1.3.2 1.3.3 1.3.4 & 1.3.5	3		4&5	SE&ES	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	6,000	---	---	

Spotfin Chub

Part III Implementation Schedule

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS Region	FWS Program	Other	FY 1	FY 2	FY 3	
M3,M7	Determine measures needed to minimize threats and implement where needed to meet recovery	1.3.6	3	Unknown	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP, NCWRC & TN,VA& NC Nature Conservancy (TNC)	---	Unknown	---	
01,04	Solicit help in protecting species and essential habitat	1.4.1 1.4.2 1.4.3 1.4.4	3	Continuous	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP NCWRC&TNC	2,000	2,000	2,000	
01	Develop and utilize information and education programs (slide/tape shows, brochures, etc) for local distribution	1.4.5	3	1 yr for devel. continuous implementation	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP, NCWRC&TNC	5,000	1,000	1,000	
I13	Survey rivers within species' historic range to determine availability of suitable transplant sites	2.1	3	1 yr.	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP, NCWRC&TNC	---	5,000	---	
R13, R7	Determine best method of establishing new populations	2.2	3	2 yr.	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	---	---	2,000	Task 2.1 - 2.3 may not be required if other populations are found in task 1.2.1
M2	Reestablish populations within historic range as needed to meet recovery	2.3	3	Unknown	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	---	---	---	

Spotfin Chub

Part III Implementation Schedule

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS Region	FWS Program	Other	FY 1	FY 2	FY 3	
I12,I14 M3,M7	Implement same protective measures for these re-established populations as for known populations	2.4	3	Continuous	4&5	SE,ES	TWRA,VCGIF TVA,THP,NCNHP& NCWRC	---	---	---	
R8-R11	Conduct life history studies on a need-to know basis	3.	3	Unknown	4&5	SE	TWRA,VCGIF THP,TVA,NCNHP& NCWRC	---	Unknown	---	These studies will be developed and carried out where there is a specific need for data necessary to reach recovery
M3	Investigate the need for habitat improvement and implementation only where needed to meet recovery objective	4.	3	Unknown	4&5	SE	TWRA,VCGIF THP,TVA,NCNHP& NCWRC	---	Unknown	---	
I1,I2	Develop and implement a monitoring program	5.	3	Unknown	4&5	SE	TWRA,VCGIF THP,TVA,NCNHP& NCWRC	---	---	5,000	
04	Annual assessment of recovery program and modify where needed	6.	3	Continued	4&5	SE	TWRA,VCGIF TVA,THP,NCNHP, NCWRC&TNC	500	500	500	

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.

APPENDIX

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